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## Sheet 4 (Basic searching algorithms)

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1. Write a C# console program that creates an array of 20 integer numbers, fills it with random integers numbers between 0 and 100, then implement and test the following:
  - a) Sequentially search for a value in an array, if the value is in the array the searching algorithm returns its index; otherwise, it returns -1 as not found code. The program should repeatedly ask the user for a value to search for until the user enters -2 as a code for end searching.
  - b) Search for the maximum value in the array using the sequential search algorithm and returns its index
  - c) Search for the maximum value in the array using the sequential search algorithm and returns its index

The searching algorithms should be implemented as separate functions in your program.

2. Write a C# console program to do the following:
  - a) Create a text files (nums.text) that contains 1000 random integer numbers each one lies in the interval [0-1000] and each one is located on a separate line in the text file.
  - b) Sequentially search for a value in text file, if the value is in the file the searching algorithm returns its zero-based line number; otherwise, it returns -1 as not found code. The program should repeatedly ask the user for a value to search for until the user enters -2 as a code for end searching.
  - c) Search for the maximum value in the file using the sequential search algorithm and returns its zero-based line number
  - d) Search for the maximum value in the file using the sequential search algorithm and returns its zero-based line number

The searching algorithms should be implemented as separate functions in your program.

3. Write a C# program that implement and test the sequential search algorithm. Design the algorithm so that it optimizes the data to make searching the frequently searched data faster in two different ways.
4. Write a C# program that creates an array of 20 integer values sorted accidentally. The program then searches the array for a value asked by the user using the binary search algorithm. If the value is in the array, the programs displays the index where it's found, otherwise it displays -1 as a code for not found data. Implement the binary search in two forms: iteratively and recursively.
5. The basic sequential search algorithm will always find the first occurrence of an item in a data set. Create a new sequential search method that takes a second integer argument indicating which occurrence of an item you want to search for. Write a C# console program to implement and test your algorithm.

6. The basic binary search algorithm will always find out if an item exists in data set or not. Create a new binary search method that returns the number of occurrence of an item in an array. Write a C# console program to implement and test your algorithm.
7. What is the big O complexity of sequential and binary search algorithms?